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FACT SHEET



UNITED STATES
DEPARTMENT
OF AGRICULTURE

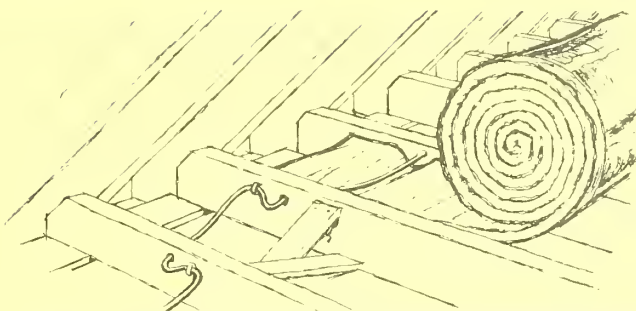
ENERGY CONSERVATION IN THE RURAL HOME

What to Look for in Selecting Insulation

By installing adequate insulation, you may be able to save 20 to 30 percent of the energy used to heat your home during winter. Adequate insulation will also make your home cooler in the summer—so by improving your home's insulation, you may be able to save 10 percent of the energy used in cooling. In addition, when your home is well insulated, the inside temperatures are more uniform and your home is more comfortable.

What kind of insulation should you select? That will depend on the amount of insulation you need, where you will apply it, how easily it can be installed, its availability, and its cost in relation to the amount of insulation it provides.

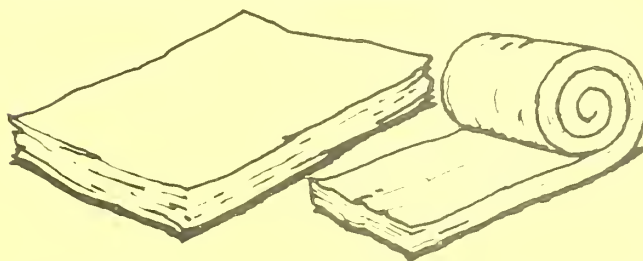
Make your decision first by looking at the "R" value (the resistance of the insulation to heat flow) on the insulation manufacturer's label. The larger the R value, the better the material's insulating capacity. You'll find that some R values are listed "per inch" of thickness of the insulating material. In those instances, figure the inches of thickness times the R "per inch" to get the total R value of the product. Table 1 shows the R values of several insulating materials. Manufacturer's variations cause some deviations from these values. Installation techniques can cause others.



INSTALL BLANKETS OR BATTS WITH VAPOR BARRIER FACING DOWN TOWARD THE ROOM BELOW

Remember that compaction or settling will reduce the effective R value of an insulation. That's because insulation effectiveness comes from trapping small air spaces within the insulation material. The air spaces reduce the flow of heat out of the home in the winter and into the home in the summer. Compaction reduces those air spaces. If the insulation shrinks or settles in the walls, gaps may form around the edges of insulation, thus reducing its effectiveness.

Gaps can make the performance of new insulation different from the R values that are suggested in table 1. Reliable insulation installers should be able to advise you on this. Also check on the past performance (other users' experiences with a particular product). Regardless of the make or effectiveness of the insulation you buy, you will find it in one of four forms:



1. *Blankets or batts*—Fibers made into sheets for easy installation. The width of blankets and batts corresponds to standard stud spacings. Blankets are continuous rolls, which can be hand-cut to the length you need. Batts are precut to 4- and 8-foot lengths.

2. *Loose fill*—Loose fibrous or granular materials that can be poured into place.

The best form of insulation for you depends on where you plan to apply it within your house. For example, blown fill insulation is your best form for hard-to-reach areas. If you plan to do your own installation, batts,

Table 1.—Nominal R values for various thicknesses of insulation

(inches of thickness)

R-Value	Batts or blankets		Loose and blown fill				
	glass fiber	rock wool	glass fiber	rock wool	cellulose fiber	vermiculite	perlite
R-11	3-1/2	3	5	4	3	5	4
R-13	4	3-1/2	6	4-1/2	3-1/2	6	5
R-19	6	5	8-1/2	6-1/2	5	9	7
R-22	7	6	10	7-1/2	6	10-1/2	8
R-26	8	7	12	9	7	12-1/2	9-1/2
R-30	9-1/2	8	13-1/2	10	8	14	11
R-33	10-1/2	9	15	11	9	15-1/2	12
R-38	12	10-1/2	17	13	10	18	14

The R-Value for urea-formaldehyde foam is 4.2 per inch of thickness. However, a bulletin (Use of Materials Bulletin No. 74, Sept. 15, 1977) from the Department of Housing and Urban Development (HUD) indicates that the effective R-Value of this type of fill is only 3.3 per inch when installed, due to a 6-percent average linear shrinkage. Therefore, urea-formaldehyde foam in a 3-1/2 inch wall cavity would have an R-Value of 10.5.

Table 2.—Method of installation, advantages, and materials of various forms of insulation

Form	Method of installation	Where applicable	Advantages	Materials
Blankets or batts	Fitted between wood-frame studs joists and beams	—All unfinished walls, floors, and ceilings	—Do-it-yourself —Best suited for standard stud and joist spacing, which is relatively free from obstructions, —Blankets: Little waste because it's hand-cut —Batts: More waste, but easier to handle than large rolls	Rock wool Glass fiber
Loose fill (poured in)	Poured between attic joists	—Unfinished attic floors and hard-to-reach places —Irregularly shaped areas and around obstructions	—Do-it-yourself —Easy to use for irregularly shaped areas and around obstructions	Rock wool Glass fiber Cellulose fiber Vermiculite Perlite
Blown fill	Blown into place by special equipment	—Anywhere that frame is covered on both sides, such as side walls —Unfinished attic floors obstructions and hard-to-reach places	—The only insulation that can be used in finished areas —Easy to use for irregularly shaped areas and around obstructions	Rock wool Glass fiber Cellulose fiber Urea-formaldehyde foam (not recommended for unfinished areas)
Rigid insulation	Must be covered with 1/2-inch gypsum board or other finishing material for fire safety.	—Basement masonry walls —Exterior walls under construction	—High insulating value for relatively little thickness	Polystyrene board Polystyrene board Isocyanurate board



blankets, or loose fill forms will probably be your choice.

You'll find that about the only practical way to insulate finished walls is to have a contractor "blow in" fill with pneumatic machinery. Table 2 provides a summary of the forms of insulation that are available, where they are best used, and their advantages.

Although it is usually simplest to match insulation when adding new to old, different forms of insulation can be used together. You can place batts or blankets over loose fill in attics, or vice versa, but be careful not to create a second gap or barrier that will trap moisture that leaks through the inside barrier. You can usually get batts or blanket insulation without a vapor barrier; if not, you can perforate the barrier before placing the insulation. It is not recommended that you add insulation to walls that already have insulation.

Vapor barriers should be used on the inside surface of any insulation that you place on a wall, ceiling, or floor that is exposed to cold. Those barriers are simply special backing materials—usually paper, plastic, or foil. They prevent moisture from inside rooms from moving out into the insulation and saturating it. The barrier's effectiveness is lost if you aren't careful to prevent accidental perforation during installation. Note: In some cases, with exceptionally well-weatherized homes in humid climates, when there has not been sufficient moisture loss, mildew has occurred. In that situation, don't use a

ceiling vapor barrier—but see that the attic is adequately vented.

You can buy batts and blankets with the vapor barriers already attached, but you can also install vapor barriers independent of the insulation.

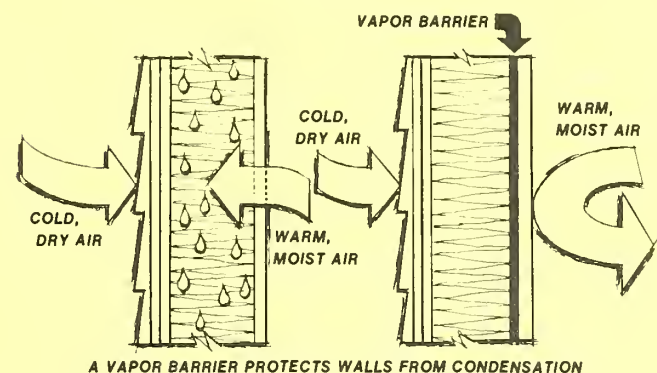
Safety. The R values, vapor barriers, and costs are not the only things to consider when you select insulation; also look at fire and health safety, resistance to vermin and pests, and freedom from odors. Beware of possible skin reactions and eye irritations. Those can be avoided by wearing protective clothing that can be washed or discarded after use. Dust from cellulose and fire-retardant chemicals are the primary skin irritants, but glass-like particles and fibers can also irritate the skin.

Fiberglass, rock wool, vermiculite, and perlite are naturally fire resistant. Urea formaldehyde is relatively fire resistant. Sometimes, however, these materials are enclosed in a material that is not fire retardant.

Cellulose is made from ground-up or shredded newspaper or wood that usually has been treated with a fire-retardant chemical. Look for a label that assures that the material meets Federal specifications. Avoid using cellulose in moist locations. It can deteriorate rapidly, and moisture and wetness can cause it to lose its fire retardancy. The chemical treatment might also corrode metal with which it is in contact.

Protect polystyrene and polyurethane from potential ignition sources (a source of fire). Fire-retardant forms are available. Use the fire-retardant form wherever fire retardance is important. Urea formaldehyde decomposes in sunlight, high temperatures, and high humidity. It is usually mixed at the home as it is installed. If the work is not properly done, disagreeable formaldehyde vapors can be released into the home.

Before you select your insulation, be sure to check labels of products and the skill of the installer. Visit with others who have installed the material to learn of potential problems, particularly problems relating to installation. Look for acknowledgement that the material meets Federal or American Society for Testing and Materials (ASTM) specifications. Where subject to building codes, be sure to check with local authorities to see if the insulation that you are considering meets code requirements.



Facts Sheets In The Home Weatherization Series

1. Why Weatherize Your Home?
2. How To Determine Your Insulation Needs
3. Saving Heating and Cooling Dollars With Weatherstripping and Caulking
4. How To Save Money With Storm Doors and Windows
5. What To Look For In Selecting Insulation
6. How To Install Insulation For Ceilings
7. How To Install Insulation For Walls
8. How To Install Insulation For The Floor and Basement
9. Solving Moisture Problems With Vapor Barriers and Ventilation
10. Weatherize Your Mobile Home To Keep Costs Down, Comfort Up
11. Tips On Financing Home Weatherization
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This series of fact sheets was assembled from research, Extension, and other sources by the USDA Task Force on Weatherization.